



E. I. DU PONT DE NEMOURS & COMPANY
INCORPORATED

P. O. Box 1217
PARKERSBURG, W. VA. 26101

CC: E. D. Champney, Jr. - Wilm.
D. K. Duncan - Wilm.
J. W. Raines/R. M. Shepherd-Wil
R. J. Burger
R. E. Putnam

POLYMER PRODUCTS DEPARTMENT

September 30, 1980

PERSONAL AND CONFIDENTIAL

TO: T. F. JORDAN
TOKYO

J. S. LINDELL
DORDRECHT

FROM: PAUL THISTLETON
WASHINGTON WORKS

TEFLON® DIVISIONS - C-8 (FC-143) CONTROL

Attached is a copy of the "Status and Program" that was reviewed at our Teflon® Divisions' C-8 meeting on Sept. 25, 1980.

Please let me know if you have comments or questions.

Attachment

PT/nsw

EID077237

TEFLON® DIVISIONS C-8 (FC-143) CONTROL

STATUS AND PROGRAM

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		1981											
		<u>JULY</u>	<u>AUG.</u>	<u>SEPT.</u>	<u>OCT.</u>	<u>NOV.</u>	<u>DEC.</u>	<u>JAN.</u>	<u>FEB.</u>	<u>MARCH</u>			
A.	<u>COMMUNICATION MEETINGS</u>												
(1)	August - Nine shift meetings held for Mechanics, Operators and Research Semiworks Operators. Kronberg and Steiner reviewed C-8 toxicity, discussed engineering controls, protective equipment, etc.		X										
(2)	Oct. - Meeting(s) will be held for laboratorians.				X								
B.	<u>EPIDEMIOLOGY STUDIES</u>												
(1)	1/25 - Medical Division Statement based on liver enzyme study - ". . . there is no conclusive evidence of an occupationally related health problem among workers exposed to C-8." (report expected in Oct.).												
(2)	July - Teflon® area workers had no significant excess of heart attacks compared with rest of plant.												
(3)	July - Teflon® area workers had no significant difference in blood pressure from a control group with no Teflon® (or C-8) exposure (adjusted for age, smoking, etc)												
(4)	August - 3M Medical Dept. published a paper, "Health status of plant workers exposed to fluorochemicals - a preliminary report." in the American Industrial Hygiene Association Journal.		X										

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STATUS AND PROGRAM

		<u>1981</u>											
		<u>JULY</u>	<u>AUG.</u>	<u>SEPT.</u>	<u>OCT.</u>	<u>NOV.</u>	<u>DEC.</u>	<u>JAN.</u>	<u>FEB.</u>	<u>MF</u>			
C.	<u>BLOOD ANALYSES</u>												
(1)	May - Comparison at Jackson Lab showed good agreement of 3M (Bomb) and Du Pont (Torch) methods at low levels (0.3 and 1.2 ppm fluorine).												EID077240
(2)	May - C-8 Specific method demonstrated at ESL (improved 3M method).												
(3)	8/1 - Letter detailing blood sampling program issued. Includes comparison of analytical methods and discussion of data interpretation.		X										000211
(4)	8/4 - Release of employee communication "Fluoro-surfactants in Blood" started. It described blood sampling plans and summarized overall program.		X										
(5)	August - ESL established for C-8 Specific blood analyses.		X										
(6)	August - Sampling started for comparison of test methods.		X										

		1981											
		<u>JULY</u>	<u>AUG.</u>	<u>SEPT.</u>	<u>OCT.</u>	<u>NOV.</u>	<u>DEC.</u>	<u>JAN.</u>	<u>FEB.</u>	<u>MAR.</u>			
C.	<u>BLOOD ANALYSES - (continued)</u>												
(7)	9/2 - Comparison of C-8 Specific and Torch methods started at ESL. About 25 samples from WW Teflon® workers will be tested.			X									
(8)	Nov. - Decide which method should be used for routine analyses.					X							
(9)	Nov. - Start routine sampling as outlined in 8/1/80 letter.					X							
D.	<u>TOXICITY TESTS AND EXPOSURE LIMITS</u>												
(1)	2/11- - Inhalation subacute test 2/29 exposure period.												
(2)	2/22 - Blood analyses finished for skin subacute tests.												
(3)	August - Haskell Lab ingestion studies • showed no significant sex differences in lethal doses for guinea pigs, mice and rats. Tests made by 3M showed that female rats eliminate C-8 much faster than males.		X										
(4)	Oct. - Initial blood results from inhalation subacute tests.				X								

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		<u>JULY</u>	<u>AUG.</u>	<u>SEPT.</u>	<u>OCT.</u>	<u>NOV.</u>	<u>DEC.</u>	<u>JAN.</u>	<u>1981</u> <u>FEB.</u>	<u>MARCH</u>
D.	<u>TOXICITY TESTS AND EXPOSURE LIMITS</u> - (continued)									
	(5) Sept. - Haskell Lab report on skin subacute tests to be issued.			X						
	(6) Jan '81 - AEL Committee Review							X		
E.	<u>C-8 SUPPLY</u>									
	(1) 7/31 - 3M representatives visited WW to promote rapid conversion from current solid C-8 (from ribbon dryer) to spray dried C-8. Change in dryer eliminates many of their environmental problems. Activity on C-8 solution terminated (at least temporarily).	X								
	(2) August - 450 lb. spray dried C-8 received from 3M for evaluation.		X							
	(3) Sept. - Fine powder, granular and FEP made using spray dried C-8 in EOD tests. Dispersion polymerization reaction rate 10 - 15% below normal. Granular polymer thermal stability below normal. May be a problem with operator acceptance because C-8 is very fine and clings to scoops.			X						
	(4) 9/17 - 3M representatives visited WW to review spray dried C-8 evaluation. More semiworks evaluation of samples will be made before plant tests.			X						

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STATUS AND PROGRAM

										1981
	<u>JULY</u>	<u>AUG.</u>	<u>SEPT.</u>	<u>OCT.</u>	<u>NOV.</u>	<u>DEC.</u>	<u>JAN.</u>	<u>FEB.</u>	<u>MARCH</u>	
F. <u>C-8 REPLACEMENT</u>										
(1) 3/4 - Evaluation of "in-situ" surfactant recommended. (Morgan/Thistleton letter)										
(2) May - Semiworks products made with three fluorinated surfactants appear to yield satisfactory end product. Evaluation continues.										
(3) 5/8 - PMN* testing program reviewed at Haskell Lab. Tests will include monitoring blood fluoride levels.										
(4) August - Tests authorized. Timing depends on availability of material.										
(5) ** - FEP Plant Test.										

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* Premanufacture notice as required by TOSCA.

** Timing depends on toxicity testing and plant availability.

1981

	<u>JULY</u>	<u>AUG.</u>	<u>SEPT.</u>	<u>OCT.</u>	<u>NOV.</u>	<u>DEC.</u>	<u>JAN.</u>	<u>FEB.</u>	<u>MARCH</u>
I. <u>ENGINEERING CONTROLS - FEP</u>									
(1) Sept. - Completed COD TY-077 Eliminate free falling streams in clean room by installing eductors under V-Disc press and Torus Disc dryer scrubber. -- (\$32,000)			X						
(2) Coagulator to fluff bin seal.									
July -- Drafting request.	X								
Oct. - COD issue.				X					
Dec. - Installed on one coagulator						X			
(3) New recycle tank to return recycle tank fluff to fluff blender instead of manual dipping.									
Sept. - COD circulating (\$36,000)			X						
Feb. - New tank installed.								X	
(4) Eliminate the once/shift dumping of coagulator bag filter.									
Aug. - COD TY-127 approved (\$7800).		X							
Nov. - Installed					X				
(5) Provide means to vacuum sump rather than scoop polymer - COD TY-085 (\$5900)									
Sept. - Equipment due.			X						
Oct. - In use.				X					

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1981

	<u>JULY</u>	<u>AUG.</u>	<u>SEPT.</u>	<u>OCT.</u>	<u>NOV.</u>	<u>DEC.</u>	<u>JAN.</u>	<u>FEB.</u>	<u>MARCH</u>
I. <u>ENGINEERING CONTROLS - FEP - (continued)</u>									
(6) Engineering controls at trayout.									
July -- Rec'd recommendations from Fernandes, ESD Consultant, on dust control and ventilation.	X								
Aug. -- Drafting request.		X							
Nov. -- COD issue - (\$40,000)					X				
May '81 -- Installation.									
(7) Eliminate polymer exhaust from coagulation bag filter.									
Sept -- Receive bags from vendor for evaluation.			X						
Nov. -- Install first set.					X				
Dec. -- Install second set, if necessary.						X			
Jan. -- Install third set, if necessary.							X		
Feb. -- Determine final effluent concentration and determine necessary stack height.								X	
(8) Eliminate the manual dumping of the central vacuum system.									
Oct. -- COD issue - (\$17,750).				X					
March '81 -- Installed.									X

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	<u>JULY</u>	<u>AUG.</u>	<u>SEPT.</u>	<u>OCT.</u>	<u>NOV.</u>	<u>DEC.</u>	<u>JAN.</u>	<u>FEB.</u>	<u>MARCH</u>
I. <u>ENGINEERING CONTROLS - FEP - (continued)</u>									
(9) Raise exhaust stacks of coagulation and wet finishing bag filters.									
March -- Determine final concentration after bag test.									X
April -- Contact Wevodau for height needed.									
May -- COD issue.									
(10) Investigate Shoe cleaner.									
July - Installed but removed from service twice due to decanter overflows.									
(11) Determine effect of Torus Disc product temperature on C-8 concentration.									
Sept. - Asked ADG to set up bench scale work because too much plant penalty.			X						
Nov. - Complete bench scale work and issue findings.					X				
(12) Prevent hot steams containing polymer/ C-8 from flowing through sumps.									
Sept. - COD TY-183 (\$4700).			X						
Dec. - Installation						X			

X
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STATUS AND PROGRAM

										1981
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	<u>JULY</u>	<u>AUG.</u>	<u>SEPT.</u>	<u>OCT.</u>	<u>NOV.</u>	<u>DEC.</u>	<u>JAN.</u>	<u>FEB.</u>	<u>MARCH</u>
J. <u>ENGINEERING CONTROLS-FINE POWDER/DISPERSION</u>									
(1) May - completed COD TX-586 - Raise Fine Powder dryer air supply inlets to exhaust additional airborne C-8 (\$1,200).									
(2) May - completed COD TY-047 - Internal Fine Powder dryer fan guards to exhaust airborne C-8 during outages - (\$8,500).									
(3) May - completed COD TY-048 - Additional inspection windows for Fine Powder dryers (\$2,500).									
(4) May - completed COD TY-061 - Improve dispersion ingredients hood and its exhaust stack - (\$5,000).									
(5) May - Improved sealing of Fine Powder Dryers - included better door seals and sealing between dryer sections.									
(6) Oct. - Further improvements to be made in dryer sealing.				X					
(7) Reduce Fine Powder Dryer Exhaust Stacks' C-8 emissions - (\$100,000).									
Nov. - COD approval					X				
May '81 - Installation									
(8) Oct. - Seal holes in floor above Fine Powder Dryers to reduce C-8 concentration upstairs.				X					
(9) Increase exhaust capacity from #2 Dryer.									
Oct. - COD issue.				X					
Feb. - Installation								X	

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TEFLON® DIVISIONS C-8 (FC-143) CONTROL

STATUS AND PROGRAM

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AJP003821

1981

JULY

AUG.

SEPT.

OCT.

NOV.

DEC.

JAN.

FEB.

MARCH

A. COMMUNICATION MEETINGS

- (1) August - Nine shift meetings held for Mechanics, Operators and Research Semiworks Operators. Kronberg and Steiner reviewed C-8 toxicity, discussed engineering controls, protective equipment, etc.

X

- (2) Oct. - Meeting(s) will be held for laboratorians.

X

B. EPIDEMIOLOGY STUDIES

- (1) 1/25 - Medical Division Statement based on liver enzyme study - "... there is no conclusive evidence of an occupationally related health problem among workers exposed to C-8." (report expected in Oct.).

- (2) July - Teflon® area workers had no significant excess of heart attacks compared with rest of plant.

X

- (3) July - Teflon® area workers had no significant difference in blood pressure from a control group with no Teflon® (or C-8) exposure (adjusted for age, smoking, etc)

X

- (4) August - 3M Medical Dept. published a paper, "Health status of plant workers exposed to fluorochemicals - a preliminary report." in the American Industrial Hygiene Association Journal.

1/8 of Teflon area workers are on antihypertensive drugs whereas 3/8 C-8 workers are on antihypertensive drugs. However, a sample of 8 persons - can't really say it's statistically significant. Also, only took one set of blood pressure readings - These vary somewhat by the each person taking them - should take a set of 2 or 3 readings.

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EID077250

STATUS AND PROGRAM

1981

JULY

AUG.

SEPT.

OCT.

NOV.

DEC.

JAN.

FEB.

MA

C. BLOOD ANALYSES

- (1) May - Comparison at Jackson Lab showed good agreement of 3M (Bomb) and Du Pont (Torch) methods at low levels (0.3 and 1.2 ppm fluorine).
- (2) May - C-8 Specific method demonstrated at ESL (improved 3M method).
- (3) 8/1 - Letter detailing blood sampling program issued. Includes comparison of analytical methods and discussion of data interpretation.
- (4) 8/4 - Release of employee communication "Fluoro-surfactants in Blood" started. It described blood sampling plans and summarized overall program.
- (5) August - ESL established for C-8 Specific blood analyses.
- (6) August - Sampling started for comparison of test methods.

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EID077251

STATUS AND PROGRAM

1981

JULY AUG. SEPT. OCT. NOV. DEC. JAN. FEB. MAR.

C. BLOOD ANALYSES - (continued)

- (7) 9/2 - Comparison of C-8 Specific (GC) and Torch methods started at ESL. ~~About 29~~ samples from WW Teflon® workers ~~will be tested.~~ X
- (8) Nov. - ~~Decide which method should be used for routine analyses.~~ C-8/GC method recommended X
- (9) ~~Dec~~ ~~Nov~~ ~~Feb~~ - Use of C-8/GC method approved by Manufacturing Division. Start routine sampling as outlined in 8/1/80 letter. X

D. TOXICITY TESTS AND EXPOSURE LIMITS

- (1) 2/11 - Inhalation subacute test exposure period. 2/29
- (2) 2/22 - Blood analyses finished for skin subacute tests.
- (3) August - Haskell Lab ingestion studies showed no significant sex differences in lethal doses for guinea pigs, mice and rats. Tests made by 3M showed that female rats eliminate C-8 much faster than males. X
- (4) Oct. - Initial blood results from inhalation subacute tests. X

000223

EID077252

STATUS AND PROGRAM

		1981											
		<u>JULY</u>	<u>AUG.</u>	<u>SEPT.</u>	<u>OCT.</u>	<u>NOV.</u>	<u>DEC.</u>	<u>JAN.</u>	<u>FEB.</u>	<u>MARCH</u>			
D.	<u>TOXICITY TESTS AND EXPOSURE LIMITS</u> - (continued)												
	(5) Sept. ^{Oct} - Haskell Lab report on skin subacute tests to issued.			X									
	(6) Jan 1981 ^{April} - AEL Committee Review							X					
E.	<u>C-8 SUPPLY</u>												
	(1) 7/31/80 3M representatives visited WW to promote rapid conversion from current solid C-8 (from ribbon dryer) to spray dried C-8. Change in dryer eliminates many of their environmental problems. Activity on C-8 solution terminated (at least temporarily).	X											
	(2) August 80 450 lb. spray dried C-8 received from 3M for evaluation.		X										
	(3) Sept. 80 - Fine powder, granular and FEP made using spray dried C-8 in EOD tests. Dispersion polymerization reaction rate 10 - 15% below normal. Granular polymer thermal stability below normal. May be a problem with operator acceptance because C-8 is very fine and clings to scoops.			X									
	(4) 9/17/80 3M representatives visited WW to review spray dried C-8 evaluation. More semiworks evaluation of samples will be made before plant tests			X									

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STATUS AND PROGRAM1981JULYAUG.SEPT.OCT.NOV.DEC.JAN.FEB.MARCHF. C-8 REPLACEMENT

- (1) 3/4 - Evaluation of "in-situ" surfactant recommended. (Morgan/Thistleton letter)
- (2) May 8 - Semiworks products made with three fluorinated surfactants appear to yield satisfactory end product. Evaluation continues.
- (3) 5/8/85 PMN* testing program reviewed at Haskell Lab. Tests will include monitoring blood fluoride levels.
- (4) August 8 - Tests authorized. Timing depends on availability of material. X
- (5) ** - FEP Plant Test.

* Premanufacture notice as required by TOSCA.

** Timing depends on toxicity testing and plant availability.

000225

EID077254

STATUS AND PROGRAM

	<u>JULY</u>	<u>AUG.</u>	<u>SEPT.</u>	<u>OCT.</u>	<u>NOV.</u>	<u>DEC.</u>	<u>JAN.</u>	<u>FEB.</u>	<u>MARCH</u>
<u>1981</u>									
G. <u>AIR MONITORING</u>									
(1) April - 7 day personal sampling program for Fine Powder & FEP Wet Finishing Operators showed 60 to 80% above 0.6 mpb limit.									
(2) Sept. - 7 day personal samples for Fine Powder Dryer Operators had an average of 0.25 mpb with no values above limit.			X						
(3) Sept. - 7 day personal samples for FEP Wet Finishing Operators had an average of 0.91 mpb. Personal samples in April had an average of 0.95 mpb.			X						
(4) * - Repeat personal sampling for Fine Powder and Wet Finishing Operators and FEP PK operators.									
H. <u>AIR MONITORING PROCEDURE</u>									
(1) May - Comparison of methylene blue and C-8 Specific methods (developed at ESL) using split sample shows excellent agreement.									
(2) May - Chloroform/Azure A Method developed from Dutch method by C. S. Cope.									
(3) 9/2 - C-8 Specific method available for review at WW.			X						
(4) Oct. - Recommend preferred method for routine use.				X					

* Will depend on completion of Engineering Controls.

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EID077255

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STATUS AND PROGRAM

1981

I. ENGINEERING CONTROLS - FEP

JULY AUG. SEPT. OCT. NOV. DEC. JAN. FEB. MARCH

(1) Sept. - Completed COD TY-077
Eliminate free falling streams
in clean room by installing
eductors under V-Disc press
and Torus Disc dryer
scrubber. -- (\$32,000)

X

(2) Coagulator to fluff bin seal.

July -- Drafting request.

X

Oct. -- COD issue.

X

Dec. -- Installed on one coagulator

X

X

(3) New recycle tank to return recycle
tank fluff to fluff blender instead
of manual dipping.

Sept. - COD circulating
(\$36,000)

X

July - Feb. -- New tank installed.

(4) Eliminate the once/shift dumping
of coagulator bag filter.

Aug. - COD TY-127 approved (\$7800).

X

Nov. -- Installed (done)

X → X

(5) Provide means to vacuum sump rather
than scoop polymer - COD TY-085 (\$5900)

Sept. - Equipment due.

X

Oct. - In use.

Nov - Failed Trial
Retest/Redesign

X

000227

EID077256

STATUS AND PROGRAM

1981

	<u>JULY</u>	<u>AUG.</u>	<u>SEPT.</u>	<u>OCT.</u>	<u>NOV.</u>	<u>DEC.</u>	<u>JAN.</u>	<u>FEB.</u>	<u>MARCH</u>
I. <u>ENGINEERING CONTROLS - FEP - (continued)</u>									
(6) Engineering controls at trayout.									
July - Rec'd recommendations from Fernandes, ESD Consultant, on dust control and ventilation.	X								
Aug. - Drafting request. Prototype being built for Prod/Mech.		X							
Nov. - COD issue - (\$40,000) Review, COD TX 677									
Review Results on Prototype (if successful)									
Oct. '81 - Installation. (if prototype acceptable)									
(7) Eliminate polymer exhaust from coagulation bag filter.									
Sept - Receive bags from vendor for evaluation.			X						
Nov. - Install first set Substantial Improvement in Total Discharge					X				
Dec. - Install second set, if necessary. Notice slight Dust Break thru <u>but</u> total discharge same as Nov.						X			
Jan. - Install third set, if necessary. Plan to go with Teflon treated bags when we combine							X		
Feb. - Determine final effluent concentration and determine necessary stack height. Call T-100 system with good weather (late as March/April).								X	
May - Determine final effluent concentration & determine necessary stack height									
(8) Eliminate the manual dumping of the central vacuum system.									
Oct. - COD issue - (\$17,750).				X					
March '81 - Installed.									X

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EID077257

STATUS AND PROGRAM

1981

	<u>JULY</u>	<u>AUG.</u>	<u>SEPT.</u>	<u>OCT.</u>	<u>NOV.</u>	<u>DEC.</u>	<u>JAN.</u>	<u>FEB.</u>	<u>MARCH</u>
I. <u>ENGINEERING CONTROLS - FEP - (continued)</u>									
(9) Raise exhaust stacks of coagulation and wet finishing bag filters.									
March - Determine final concentration									X
May after bag test.									
April - Contact Wevodau for height									
June needed.									
May - COD issue.									
July									
(10) Investigate Shoe cleaner.									
July - Installed but removed from service twice due to decanter overflows.	X								
JAN. - Re-installed at new location							X		
(11) Determine effect of Torus Disc product temperature on C-8 concentration.									
Sept. - Asked ADG to set up bench scale work because too much plant penalty.			X						
Nov. - Complete bench scale work and issue findings.						X →	X		
Dec									
(12) Prevent hot steams containing polymer/ C-8 from flowing through sumps.									
Sept. - COD TY-183 (\$4700).			X						
Dec. - Installation (done)							X →	X	
JAN. -									

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TEFLON DIVISIONS C- (FC-143) CONTROL

STATUS AND PROGRAM

1981

JULY AUG. SEPT. OCT. NOV. DEC. JAN. FEB. MARCH

I. ENGINEERING CONTROLS - FEP (continued)

- (13) Monitoring of equipment with RAM
(Real-time Aerosol Monitor) to
determine effectiveness of seals.

Fulcrum
~~Restart~~ - Restart program.

- (14) Improve ventilation in clean room
through use of diamond plate on
top of grating.

COD on hold pending outcome of
educator COD.

- (15) ~~Basic~~ Additional Breathing Air
Facilities - FEP (\$66.5m) → AIR SUPPLIED SYS.
Authorize COD - JAN

Complete Installation - MAR

House keeping Improvements

- (1) MAJOR WINANS CLEANUP OF
FEP BUILDING (51M CONTRACT
FOR TOTAL OF 4 CLEANUPS)

Issued Purch Req - JAN
1st CLEANING → FEB

MONITOR AREA FOR C-8

DECIDE TIMING FOR 2ND CLEANING

- 11 -

000230

X

→ X

> X

> X

> X

PT
9/23/80

EID077259

1AJP003831

1981

	JULY	AUG.	SEPT.	OCT.	NOV.	DEC.	JAN.	FEB.	MARCH
J. ENGINEERING CONTROLS-FINE POWDER/DISPERSION									
(1) May - completed COD TX-586 - Raise Fine Powder dryer air supply inlets to exhaust additional airborne C-8 (\$1,200).		Complete ~ 5/80							
(2) May - completed COD TY-047 - Internal Fine Powder dryer fan guards to exhaust airborne C-8 during outages - (\$8,500).		Complete 5/80							
(3) May - completed COD TY-048 - Additional inspection windows for Fine Powder dryers (\$2,500).		Comp 5/80							
(4) May - completed COD TY-061 - Improve dispersion ingredients hood and its exhaust stack - (\$5,000).		Comp 5/80							
(5) May - Improved sealing of Fine Powder Dryers - included better door seals and sealing between dryer sections.		Comp 5/80							
(6) Oct. - Further improvements to be made in dryer sealing.			X	X					
(7) Reduce Fine Powder Dryer Exhaust Stacks' C-8 emissions - (\$100,000).									
Nov. - COD approval									
May '81 - Installation (OK)									
(8) Oct. - Seal holes in floor above Fine Powder Dryers to reduce C-8 concentration upstairs.									
(9) Increase exhaust capacity from #2 Dryer.									
Oct. - COD issue.									
Feb. - Installation									

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EID077260

STATUS AND PROGRAM

1981

K. PROTECTIVE EQUIPMENT - RESPIRATORS

Comfo II

- (1) 3/5 - Use of GMA-H cartridges
(combination high efficiency
filter and activated charcoal)
approved by R. F. Kinter,
Chairman, Respiratory
Protection Subcommittee.
- (2) March-June - GMA-H cartridges
established for routine use.
- (3) May - GMA-H cartridge tested at
Haskell Lab with 1 mg/m³ C-8
(100X proposed limit)
feed. Capacity exceeds 40 hours.
- (4) 9/15 - Report on cartridge tests
issued (HLR 664-80). It should
provide a basis to extend
cartridge use to a month.
This is under review.

Air Supplied Systems

- (5) May/June - Field tested 3M Hardcap system.
- (6) July - Recommended to Production
to provide 3M Hardcap units
for all Wet Finishing personnel.
Accepted by Production
- (7) May - completed COD TY-045 (\$7290) for
breathing air stations in FEP
area.
- (8) Sept. - completed COD TY-082 (\$1,994)
for breathing air station for
weigh station.
- (9) 3/11 - COD TY-051 (\$16,750) for
breathing air stations in
Polymers area authorized.
- Oct. - Breathing air stations in
service.
- 10) ADD'L BREATHING AIR FACILITIES - FEP

JULY

AUG.

SEPT.

OCT.

NOV.

DEC.

JAN.

FEB.

MARCH

X

X

X

000232

EID077261

TYLON DIVISIONS C III (FC-143) CONTROL

STATUS AND PROGRAM

1981

	<u>JULY</u>	<u>AUG.</u>	<u>SEPT.</u>	<u>OCT.</u>	<u>NOV.</u>	<u>DEC.</u>	<u>JAN.</u>	<u>FEB.</u>	<u>MARCH</u>
L. <u>PROTECTIVE EQUIPMENT - CLOTHING</u>									
<u>Disposable Clothing & Gloves</u>									
(1) 8/28 - Started field test of protective clothing.		X							
(2) Nov. - Start field test of protective clothing with more breathing capability.					X				
(3) Feb 80 - Stock approved protective clothing in Stores.								X	
(4) May - Started routine use of #L-61 latex rubber gloves in Fine Powder/Dispersion and FEP Areas.									

000233

November 24, 1980

TO: R. J. BURGER
C. R. CAMPBELL
D. A. ERDMAN

FROM: PAUL THISTLETON 

COMMUNICATING RESULTS OF BLOOD ANALYSES

Details of recent blood analyses are given in my 11/19/80 letter to R. J. Burger (copy attached). Results of August 1979 samples have been multiplied by 1.25 in Table I for comparison with August 1980 results obtained by the C-8/GC method (compare lined columns). We believe that this adjustment is required for proper comparison.

People sampled in 1979 were given results in Columns 1 and 2 using standard medical cards. We plan to report the C-8/GC results in column 6 in the same way. Some explanation of the increased values resulting from the C-8/GC analyses will be required. It appears that this can best be handled by Dr. Power on an individual basis. He may use the attached statement for background but it will not be distributed.

When the results in column 2 are multiplied by 1.25 (see column 3) there is generally good agreement with the recent C-8/GC results (column 6). Perhaps there is a significant increase for No. 16 (a fine powder dryer operator). The value reported for No. 17 in 1979 was recognized to be unusually low and may have been inaccurate. Three of the FEP people (Nos. 19, 23 and 24) show little change between the August 1979 (column 2) and August 1980 C-8/GC results (column 6).

Attachments

PT/nsw

AJF001326

EID080726

000234

CC: R. J. Burger
J. F. Doughty
T. L. Schrenk

November 19, 1980

TO: DR. Y. L. POWER

FROM: PAUL THISTLETON 

RESULTS OF BLOOD ANALYSES

The blood sampling program proposed in my 8/1/80 letter is essentially complete. All samples have been analyzed by the C-8/GC method which was recommended for routine use in my 11/12/80 letter to R. J. Burger. Most of the samples have been analyzed by the Torch method at ESL and some have been measured by the Torch method at Jackson Laboratory (JL). Samples were sent to JL because of delays in demonstrating satisfactory Torch performance at ESL.

Results are given in Table I. It includes the 1979 data which was reported to the people sampled. Names of people sampled in 1980 and identification numbers used in Table I are given in the enclosed list (Dr. Y. L. Power, only). One person is omitted from Table I because results were variable and a resample is being requested.

The ESL and JL Torch results agree very well. The C-8/GC results are about 125% of the Torch results (see Figure 1 of my 11/12/80 letter). The difference may result from incomplete recovery in the Torch method and this is being checked at ESL and JL.

My 11/12/80 letter recommended that only C-8/GC results should be reported to employees. We believe that they are the best available measurements of organic fluorine in blood samples. The August, 1979, results given in Table I have been multiplied by 1.25 which is suggested as the basis for comparing these results with current C-8/GC results (see my 11/17/80 letter to R. J. Burger, copy attached). In most cases the numbers are very similar and it is doubtful if any of the apparent changes are statistically significant. This can be established when the total sampling program is completed and more 1979/1980 comparisons are possible.

AIPO01327

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EID080727

DR. Y. L. POWER

- 2 -

NOVEMBER 19, 1980

In the meantime I conclude that there has been no significant decrease in organic fluorine in blood samples between August, 1979 and August, 1980. This may be because many of our corrective measures were functioning for only a small part of the year. Our 1980 data using the C-8/GC method, which is specific, should provide a good basis for comparing data to be obtained in 1981.

Attachment

PT/nsw

AJP001328

EID080728

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TABLE I

COMPARISON OF BLOOD ANALYSES

IDENTIFICATION NUMBER	1979 SAMPLES BOMB ANALYSIS - JL(1)			AUGUST 1980 SAMPLES TORCH ANALYSIS - C-8/GC		
	ppm Organic Fluorine			ppm Organic Fluorine		
	JUNE	AUGUST	AUGUST X 1.25 (2)	ESL	JL	ESL
	-1-	-2-	-3-	-4-	-5-	-6-
<u>No Direct Exposure</u>						
1		-	-	0.24		0.022
2		-	-	-		0.015
<u>Professionals</u>						
3		-	-	0.03		0.22
4		-	-	0.44		0.40
5		-	-	-		0.19
6		0.45	0.56		0.3	0.52
<u>Monomer Operators</u>						
7		0.39	0.49	0.8		0.78
8 (3)		5.3	6.6	5.2		6.4
9 (4)		6.7	8.4	6.5	6.7	8.2
<u>Fine Powder Dispersion</u>						
<u>Zone 6</u>						
10	22.2	21.2	26.5	20.3	21.0	24.0
12	10.6	8.7	10.9	9.7		13.0
13	15.0	13.8	17.3	16.5		21.0
14		20.8	26.0		22.9	29.0
15		1.8	2.3	3.3	3.8	4.6
<u>Zone 4</u>						
16		1.8	2.3	4.6	4.6	5.6
<u>Granular</u>						
<u>Zone 6</u>						
17		0.47	0.59	1.4	1.7	1.9

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IDENTIFICATION NUMBER	1979 SAMPLES BOMB ANALYSIS - JL (1)			AUGUST 1980 SAMPLES TORCH ANALYSIS - C-8/GC		
	ppm Organic Fluorine			ppm Organic Fluorine		
	JUNE	AUGUST	AUGUST X 1.25 (2)	ESL	JL	ESL
	-1-	-2-	-3-	-4-	-5-	-6-
<u>FEP Polymerization</u>						
18	1.36	0.99	1.2	1.1		1.5
19		3.7	4.6	3.4		4.0
20	3.61	1.99	2.5	2.9	2.9	3.7
21		4.96	6.2	5.6		6.6
22		4.14	5.2	3.7		5.5
23		4.52	5.7	4.1		4.9
24		2.71	3.4	2.1		2.9
25		4.64	5.8	6.4		7.8
26		0.91	1.1	0.9, 1.1	0.87	1.2
<u>FEP Service</u>						
27				1.1		0.72
<u>Research Semiworks</u>						
28				0.5	0.32	0.26

- (1) JL = Jackson Laboratory
- (2) August, 1979 bomb results increased by 25%. This is the factor recommended to allow comparison of 1979 and 1980 results. ESL C-8/GC results are about 125% of ESL and JL Torch results for the August, 1980 samples. Equivalence of Torch and Bomb results was demonstrated in a study reported by Erik Kissa, Jackson Laboratory, 6/13/80.
- (3) Monomer Operator 21 months, 16 years Polymerization Service.
- (4) Monomer Operator 32 months, 15 years Polymerization Service.

PT
11/19/80

AF001330

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000238

November 24, 1980

RESULTS OF BLOOD ANALYSES

A sample of your blood was taken in August for a test program to compare two analytical methods for measuring organic fluorine in blood. The Torch method burns the blood in a special torch and the combustion products are scrubbed and analyzed for fluorine. It measures organic fluorine plus inorganic fluorocompounds that burn in the torch. The C-8/GC method measures the C-8 by gas chromatography (GC) which separates the C-8 from other fluorocompounds.

We believe that C-8/GC results are the best measurements of organic fluorine in blood samples. We plan to use the C-8/GC method for analyzing blood samples because it measures C-8 and is less subject to interference than the Torch method.

We are reporting the C-8/GC measurement for your blood sample expressed as ppm organic fluorine. This method gives results about 25% higher than the method used for the 1979 samples. The difference may result from incomplete recovery of organic fluorine in the 1979 analyses.

If you have questions please contact Medical Division.

Y. L. POWER, M.D.

EID080731

000239

KK



E. I. DU PONT DE NEMOURS & COMPANY

INCORPORATED

WILMINGTON, DELAWARE 19898

POLYMER PRODUCTS DEPARTMENT
EXPERIMENTAL STATION

W. C. Percival - 353
S. S. Stafford - 269
R. R. Twelves - 353
PRAL File
IC

January 23, 1981

TO: PAUL THISTLETON - PPD, Washington Works

FROM: L. J. PAPA

772-1745

COMMENTS ON VALIDITY OF 1979 FLUORINE IN BLOOD RESULTS

I have reviewed the 1979 blood fluorine results from Jackson Laboratory (JL) and investigated the entire situation to comment on the validity of the results. The situation is not simple because

1. The values reported were raw data and were not corrected for recovery. The data were obtained by the modified 3M bomb method (private communication with E. Kissa).
2. From data appearing in Kissa's report (CP-JL-80-14, p. 10) issued Sept. 1980, his recovery at that time appears to be ~94%.
3. 3M published a recovery of 92±5%. Belisle and Hagen, Anal. Bio. 87 545-555 (1978).
4. The bomb data correlated 1:1 with the torch data in Kissa's early work (CP-JL-80-14, p. 19-21B) - hence torch recoveries must have also been ~94%.
5. A reagent deteriorated in the modified bomb method causing the 8/79 values to be low by a factor of 1.18 (Memos, E. Kissa to G. H. Patterson dated 10/30/79 and 11/29/79). This was not discovered and communicated to WW until after the results were given to our employees.
6. A recent study by Kissa shows the torch method, which is allegedly equivalent to the bomb method, gives 83% recovery and is 80% of the value by GC (Ref: my recent letter to you dated 1/23/81).

We are left with these facts

- A. All of the results from August 1979 sampling should have been corrected by a factor of 1.18 to compensate for the deteriorated reagent.

There's a world of things we're doing something about

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ALP001317

- B. An additional correction is necessary to compensate for recovery. That factor is 1.06 if the 94% recovery of Kissa's early work is correct or 1.20 if the later 83% recovery is correct.

I have no way of judging which recovery number is correct. If fact, they both may be correct. He could have started with 94% recovery and drifted to 83% recovery. However, the numbers do allow us to set up boundaries. With the bad reagent and a 94% recovery, the correction factor is 1.25. With a bad reagent and an 83% recovery, the correction factor is 1.41. Results obtained from JL other than the August to October 1979 period do not suffer from the bad reagent contribution and the 1.18 correction factor is not applicable. However, they must still be corrected for recovery. The correction is 1.06 if you believe the 94% recovery, 1.09 if you believe the 92% recovery or 1.20 if you believe the 83% recovery.

I suggest you use the following set of corrections for any data you have in hand:

- applies to June 79 samples* • Multiply by 1.09 for all data prior to August 1, 1979 - this uses 3M's recovery of 92% and was suggested by E. Kissa.
- This probably covers all data from 79 to mid 80* • For bomb data in the period of August 1, 1979 to October 30, 1979 use a factor of 1.28 - this assumes 92% recovery and corrects for the bad reagent. For torch data in this period use a factor of 1.09.
- For the period November 1, 1979 to early 1980 (1st quarter), assume the recovery was 92% and use a factor of 1.09. The rat dermal study blood analyses were performed in this time period.
- From early 1980 on, GC values or torch values corrected for 83% & recovery are used so you have no corrections to make.

$\frac{1}{0.83} = 1.2$
but curve has 1.25 slope

I hope this letter helps to end the confusion and does not create more. If you have questions please contact me.

fmt

Based on Kissa data

ADP001318

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F



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WILMINGTON, DELAWARE 19898

POLYMER PRODUCTS DEPARTMENT
EXPERIMENTAL STATION

S. S. Stafford - 269
R. R. Twelves - 353
PRAL File
I.C.

January 23, 1981

TO: PAUL THISTLETON - PPD, Washington Works

FROM: L. J. PAPA *LJP*

SPECIFIC DETERMINATION OF PERFLUOROOCTANOIC ACID IN BLOOD
BY GAS CHROMATOGRAPHY AND COMPARISON TO TORCH METHOD

S. S. Stafford has completed development and study of a gas chromatographic method to specifically determine perfluorooctanoic acid or its salts (including FC 143), hereby defined as C₈, in human or rat blood. The method is sensitive to 7 ppb fluorine and has a precision of $\pm 10\%$ throughout most of the concentration range of 7 ppb to 100 ppm although the precision falls off at the lower ppb range. The method gives comparable results to the Modified Wickbold Torch used by E. Kissa at Jackson Laboratory and duplicated at ESL by R. R. Twelves. The principle differences are the GC method is specific, easier to use, faster, cheaper and much more sensitive. You received a copy of this method on your last visit to our laboratory on January 8, 1981.

DISCUSSION

We compared the C₈-specific GC method to torch methods at ESL (Twelves) and at JL (Kissa) by analyzing 26 human blood samples obtained from Washington Works personnel. This allowed a simultaneous comparison of the two torch methods at ESL and JL. The data is listed in Table I and plotted in Figure 1. A least squares examination of this data (line shown in Figure 1) shows the two torch methods give comparable data and are 79% of the GC numbers. The GC numbers are corrected for recovery but a true recovery study had never been performed on the torch method.

I asked Kissa (JL) to perform a recovery study on this torch method. He later reported (by telephone) that he performed a 5 concentration calibration curve study in aqueous solution from 0.5 to 12.0 ppm fluorine. The slope of his line, or recovery, was 83%. He then spiked two blood samples with 10 ppm C₈ and obtained recoveries of 80 and 84%. I conclude from these data that his recovery is 83%. R. R. Twelves has never performed such a study but indications are that he has a similar recovery. Table II lists the GC data again and the JL torch values corrected for 83% recovery - the agreement is now very good.

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There's a world of things we're going something about

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S. S. Stafford later analyzed 7 rat blood samples from a Haskell Laboratory Cg inhalation study that were also analyzed at Jackson Laboratory by the Torch Method (Kissa). These data are listed in Table III and again show good agreement.

These data show that the discussed methods can and did give equivalent results on real blood samples when all are calibrated to compensate for recovery. It should be remembered that interferences may be encountered in the future which could give erroneous answers by either method. This seems less likely with the Cg-specific GC method. For this reason as well as those mentioned in the first paragraph I think our decision to use the Cg-specific GC method is well founded.

Attachments
fmt

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TABLE I
Comparison of C₈-Specific GC Method to Torch Methods at ESL and Jackson Lab (JL)

<u>PRAL No.</u>	<u>ppm Fluorine</u>		<u>C₈/GC</u>
	<u>ESL</u>	<u>Torch</u> <u>JL</u>	
80-63841	1.1	--	1.5
80-63838	20.3	21.0	24.
80-63837	1.4	1.7	1.9
80-62921	0.5	0.3	0.26
80-63834	0.03	--	0.22
80-63835	--	0.3	0.52
80-62916	2.1	2.6	2.9
80-62915	ND	0.2	0.015
80-63839	6.5	6.7	8.2
80-62912	0.8	--	0.78
80-62920	1.0	0.87	1.2
80-62919	6.4	6.4	7.8
80-63842	3.4	--	4.0
80-63843	2.9	2.9	3.7
80-63836	0.44	--	0.40
80-62922	3.3	3.8	4.6
80-62918	22.4	22.9	29.
80-63844	5.6	--	6.6
80-62910	9.7	10.3	13.
80-62913	16.5	14.8	21.
80-62911	4.1	--	4.9
80-62917	4.6	4.6	5.6
64330 80-63833 64329	0.24	--	0.022
80-63845	1.1	--	0.72
80-62914	5.2	5.0	6.4
80-63846	3.7	--	5.5

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TABLE II
Comparison of C₈-Specific GC Method to JL Torch - Corrected for 83% Recovery

<u>PRAL No.</u>	<u>ppm Fluorine</u>	
	<u>JL Torch</u>	<u>C₈/GC</u>
80-63841	----	1.5
80-63838	25.3	24.
80-63837	2.0	1.9
80-62921	0.4	0.26
80-63834	----	0.22
80-63835	0.4	0.52
80-62916	3.1	2.9
80-62915	0.2	0.015
80-63839	8.1	8.2
80-62912	----	0.78
80-62920	1.0	1.2
80-62919	7.7	7.8
80-63842	----	4.0
80-63843	3.5	3.7
80-63836	----	0.40
80-62922	4.6	4.6
80-62918	28.	29.
80-63844	----	6.6
80-62910	12.4	13.
80-62913	17.8	21.
80-62911	----	4.9
80-62917	5.5	5.6
64330 80-63833 80-64329	----	0.022
80-63840	----	----
80-63845	----	0.72
80-62914	6.0	6.4
80-63846	----	5.5

* *triple*

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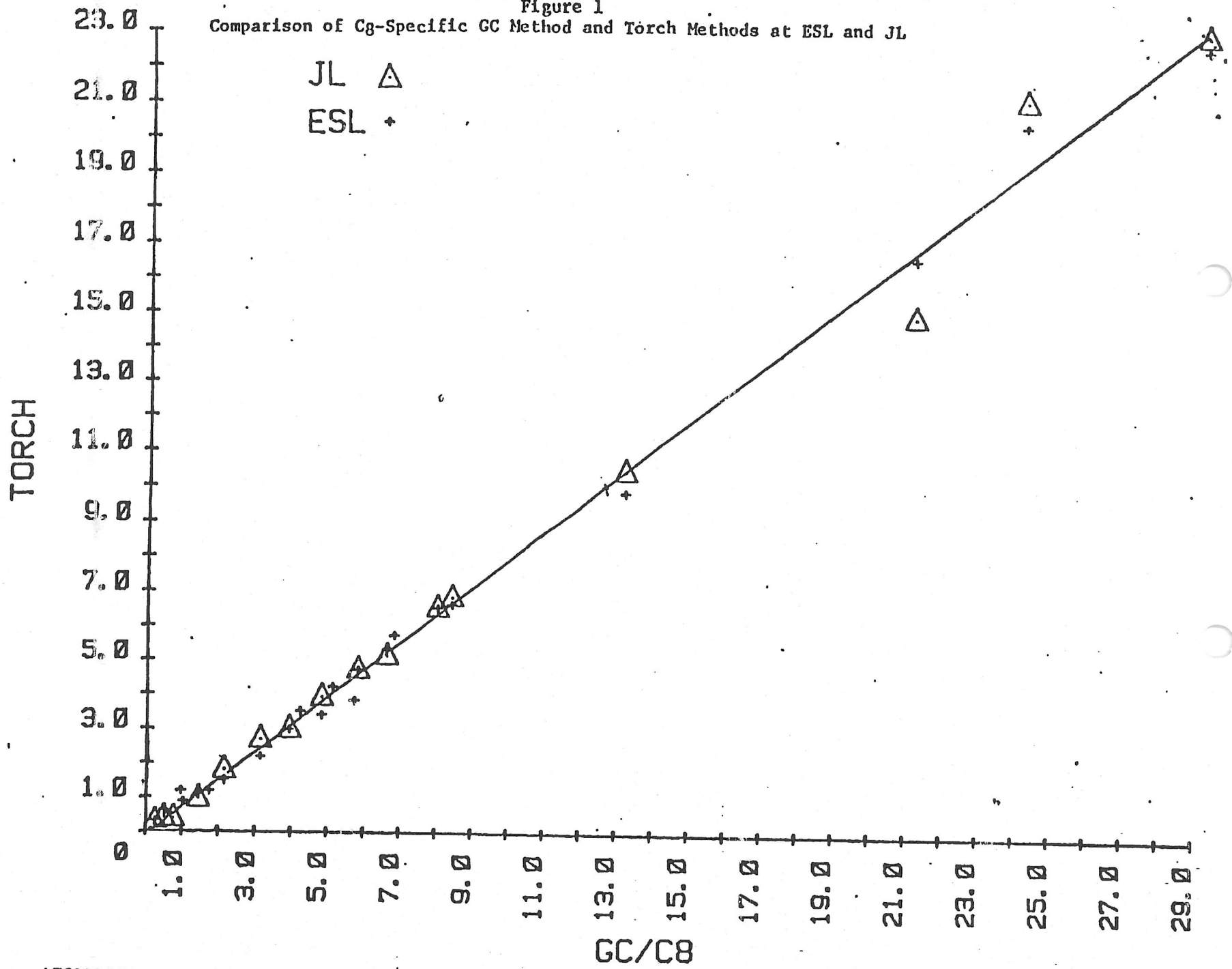
TABLE III
Comparison of C₈-Specific GC Method to Torch Method (JL) on Rat Blood

PRAL No.	ppm Fluorine		
	Torch Jackson Lab		C ₈ /GC
	Raw Data	Corrected for 83% Recover	
80-67461	6.9	8.3	7.7
80-67462	10.5	12.7	13.1
80-67752	9.5	11.4	11.4
80-67756	9.0	10.8	8.6
80-67481	1.8	2.2	1.3
80-67460	1.1	1.3	1.1
80-67484 (Blank)	0.76	0.92	<0.007

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Figure 1
Comparison of Cg-Specific GC Method and Torch Methods at ESL and JL



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